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ABSTRACT

Data from the National Longitudinal Survey of Youth are used to estimate empirically the impact on the earnings capacities of young female dropouts if they were to return to complete either a regular high school education or a General Educational Development (GED) degree. To reduce the potential upward bias on these estimated rates of return, dropouts are allowed to have lower levels of innate ability and lower rates of human capital accumulation in school. After controlling for the sample selection bias associated with the observation of wage rates among only employed women, the rates of return for the average dropout are estimated to be 10.2% for a high school diploma and 6.2% for a GED degree. After allowing for self-selection in the decision of whether or not to complete a secondary education, these estimated rates of return actually rise slightly to 10.9% and 6.5% respectively. Because of differences in other productivity characteristics, this education would only eliminate up to one-third of the substantial gap that already exists between the earnings capacities of dropouts and secondary school completers. (Contains 8 tables and 16 references.) (Author/SLD)

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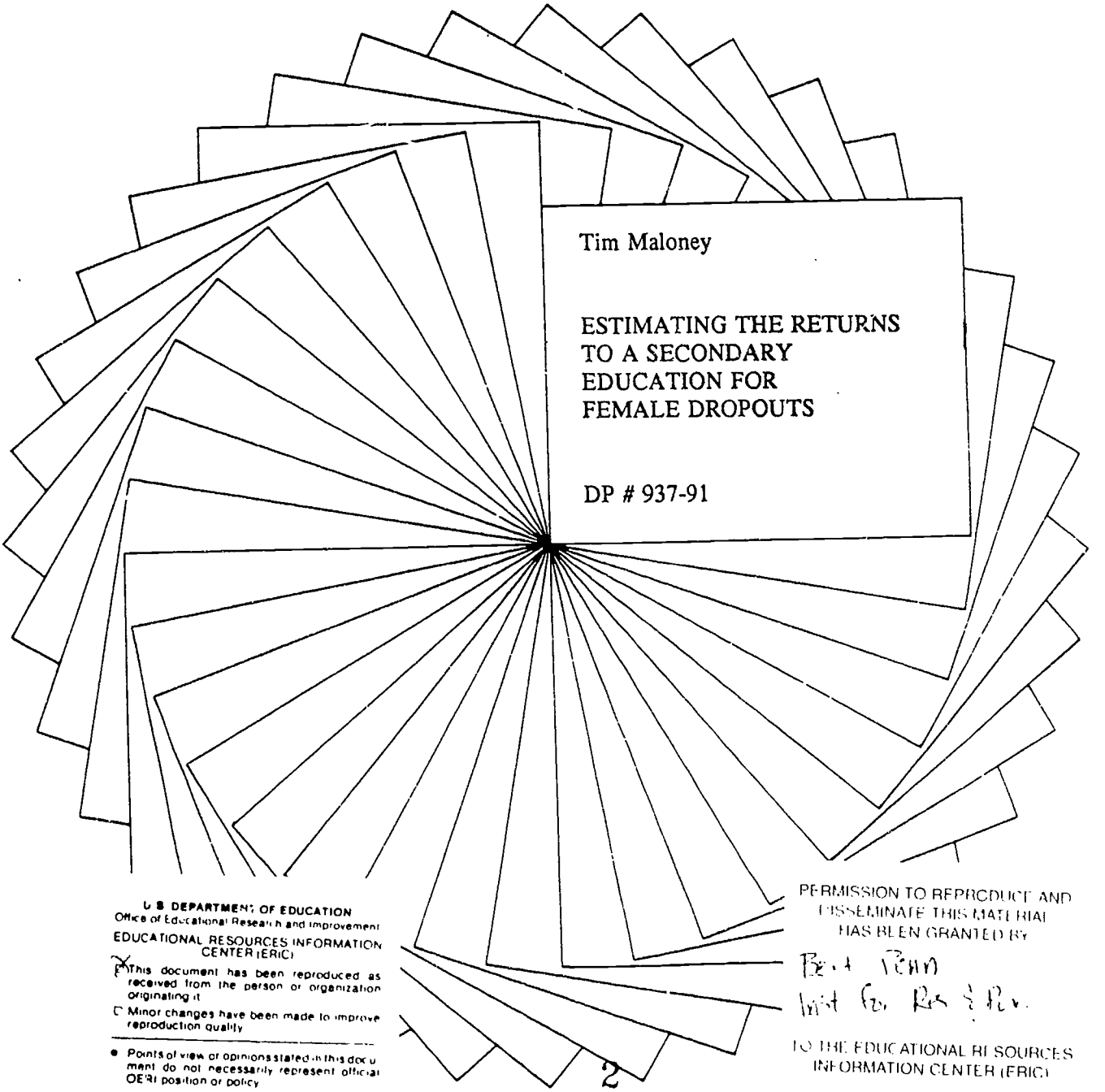

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ABSTRACT

Data from the National Longitudinal Survey of Youth is used to empirically estimate the impact on the earnings capacities of young female dropouts if they were to return to complete either a regular high school education or a General Educational Development (GED) degree. To reduce the potential upward bias on these estimated rates of return, dropouts are allowed to have lower levels of innate ability and lower rates of human capital accumulation in school. After controlling for the sample selection bias associated with the observation of wage rates among only employed women, the rates of return for the average dropout are estimated to be 10.2 percent for a high school diploma and 6.2 percent for a GED degree. After allowing for self-selection in the decision of whether or not to complete a secondary education, these estimated rates of return actually rise slightly to 10.9 percent and 6.5 percent, respectively. Because of differences in other productivity characteristics, this education would only eliminate up to one-third of the substantial gap that already exists between the earnings capacities of dropouts and secondary school completers.

ESTIMATING THE RETURNS TO A SECONDARY EDUCATION FOR FEMALE DROPOUTS

There is renewed optimism in this country over the efficacy of general educational attainment in alleviating poverty.[1] Perhaps this is a by-product of recent concerns that the government has neglected basic education and that income and in-kind transfer programs have failed to substantially reduce poverty rates. The idea is that economic self-sufficiency can best be promoted by encouraging or requiring individuals who are at risk of welfare recipiency to increase their educational attainment.

The Family Support Act of 1988 revised the national Aid to Families with Dependent Children (AFDC) program. To reduce long-term welfare dependence, states are now required to set up a Job Opportunities and Basic Skills (JOBS) program. Although states have a great deal of latitude in choosing the mix of services that will be provided to welfare recipients under their JOBS programs, some states have decided to include basic and remedial education in these packages. For example, a recent welfare reform proposal in Missouri would require AFDC recipients who have not completed their high school education and who are not exempt because of home responsibilities to work toward their high school equivalency or General Educational Development (GED) degree (Ashcroft, 1987). To make clear the potential benefits of this legislation to the majority of Missouri's AFDC recipients who are dropouts, proponents cited the substantially higher wage rates and family incomes of high school graduates in the general population.

Unfortunately, there is little research to date that either confirms or refutes such claims.[2] We simply do not know how the inherent self-selection among female dropouts would affect their expected returns to a secondary education, or how these returns might vary by the type of high school credential obtained--a regular high school diploma versus a GED degree. The preferred approach would be to observe the change in potential market wage rates or earnings capacities as a result of the completion of a secondary education among randomly assigned AFDC recipients. Since no data are

currently available from such a controlled experiment, the next best approach is to econometrically model the process that leads to differences in earnings capacities among women with different levels of educational attainment who are at risk of welfare recipiency. For this reason, a sample of young women with no more than a high school education is taken from the National Longitudinal Survey of Youth (NLSY). Regression results are then used to estimate the potential rates of return to the average female dropout if she were either to complete a regular high school education or GED degree.

Section I develops the general empirical approach used in this study. Section II describes the particular advantages of the NLSY data for the purposes of this analysis. Sections III through V formulate econometric procedures for estimating these rates of return and evaluate the empirical results. Section VI summarizes these findings and suggests future extensions to this study.

I. A CONCEPTUAL FRAMEWORK

A system of four general equations forms the basis for all of the empirical work in this paper.[3]

$$S = \alpha Z + u \tag{1}$$

$$H = \beta_1 Z + \beta_2 S + v \tag{2}$$

$$\ln W = \gamma_1 X + \gamma_2 H + \gamma_3 S + \epsilon \tag{3}$$

$$E^* = \tau_1 X + \tau_2 H + \tau_3 S + \tau_4 Q + \psi \tag{4}$$

Years of schooling (S) completed by a woman are assumed to be a linear function of the exogenous variables contained in the vector (Z) and a disturbance term (u).[4] These regressors include observable personal and family background characteristics. This reduced-form expression represents

the educational investment decision, where S is chosen so that the marginal rate of return is at least as great as the opportunity cost for her last year of schooling.

Cognitive achievement or human capital (H) accumulated by the woman at the end of her schooling is a linear function of the same vector of regressors used in equation (1), educational attainment, and a disturbance term (v). The coefficient β_2 could be interpreted as the "value added" to her human capital from each year of schooling. The error term captures innate reasoning abilities that predate or are independent of educational attainment.

Earnings capacity (W) is the wage rate facing the woman in the labor market after she has completed her schooling. It is written as a log-linear function of other proxies for her productivity (X), human capital, schooling, and a disturbance term (ϵ). Since differences in innate abilities may influence educational attainment, including the human capital variable in this equation should reduce any omitted-variable bias in estimating the returns to schooling.[5] This equation also captures the two paths by which education ultimately affects the market wage: the indirect effect that occurs through the acquisition of human capital in school and its subsequent impact on earnings capacity ($\beta_2*\gamma_2$); and the direct effect that comes from the potential signaling value of education (γ_3), because certain abilities may not be directly observable by potential employers (Spence, 1973).[6]

Since only those women who are employed and reporting a market wage rate can be included in the estimation of this wage equation, the possibility of sample selection bias must be considered. For this reason, we specify a simple linear function for the employment outcome. The latent employment propensity (E^*) depends on the observed determinants of her market wage and reservation wage (Q) (e.g., her marital status, the number and ages of children in her household). The problem is that unobserved factors that affect her earnings capacity may also affect her employment status. To produce unbiased coefficient estimates in the market wage equation, we must allow for the truncation of this error term.

II. DATA

A cross-section of young women is taken from the 1985 NLSY. This data set began collecting information on 12,686 males and females between the ages of 14 and 22 in 1979. It now contains detailed information on their educational attainment, family background, labor market conditions, measures of cognitive achievement, and wages and work. The age range of the women in 1985 (20-28) is appropriate for our study. Most have had the opportunity to complete their secondary education and to establish at least some work history. Given their relatively recent schooling experience, we should be able to assess the impact of a secondary education on their human capital formation. Policies intended to encourage or require increases in general educational attainment among welfare recipients will most likely target this younger age group.

Table 1 provides some descriptive statistics for our subsample of 2,601 young women, grouped by their educational attainment at the time of the 1985 interview. In order to treat both a high school diploma and a GED as terminal degrees, our subsample does not contain women who were enrolled in school in 1985 or who had completed any formal schooling beyond high school.[7] Nearly two-thirds of the women in our subsample had graduated from high school; of the nongraduates, about one-fourth had earned their GED degrees.[8] Those who had not earned a high school diploma or a GED degree are referred to as "dropouts" in our study.

The longitudinal data on all jobs ever held are used to construct a measure of the "effective" work experience of the women in our subsample. Every 2,000 hours of employment constitutes a year of experience. Although dropouts could have entered the labor market earlier than high school graduates of the same age, they had accumulated far less work experience at the time of the 1985 interview. Graduates were more likely to be employed than were GED recipients or dropouts. On the other hand, dropouts were far more likely to be either unemployed or discouraged.[9] Moreover, employed

TABLE 1

Descriptive Statistics for 1985 NLSY Subsample of Young Women

	High School Graduates	GED Recipients	Dropouts
Age	23.6	23.5	23.5
% Black	26.7	23.8	24.7
% Hispanic	11.9	15.0	18.0
% Raised in a household headed by a single female	18.1	25.1	30.1
Yrs. of schooling completed	12.0	10.2	9.5
Years of work experience	3.4	2.6	1.7
% Vocational training	46.6	54.2	24.9
% Currently employed	66.7	54.2	35.5
% Currently unemployed or discouraged, relative to those employed	17.4	28.4	53.0
Hourly earnings for those employed	$5.49	$5.04	$4.50
Composite ASVAB test score (H_{80})	.27	.10	-.64
% Who have not completed education at time of ASVAB tests	31.0	68.7	19.8
% Months received AFDC since education completed	7.1	13.5	20.7
Number of observations	1,650	227	724
% of overall subsample	63.4	8.7	27.8

Source: 1985 National Longitudinal Survey of Youth (NLSY).

graduates and GED recipients received average wages 22.0 percent and 12.0 percent higher, respectively, than those received by employed dropouts.

During the summer and fall of 1980, the NLSY, in cooperation with the Department of Defense and the Department of Labor, administered the Armed Services Vocational Aptitude Battery (ASVAB) to the individuals in the data set. The ASVAB is a series of paper-and-pencil tests designed to measure cognitive achievement and vocational aptitudes. Approximately 94 percent of all NLSY respondents completed these tests. Only those women who had completed the ASVAB are included in our subsample. The results from seven of the ten tests on math, reading, and science are collapsed into a single measure of human capital ("H_{80}" in equation (5) below) for the purposes of our study. These tests were chosen to represent the general cognitive skills and knowledge most likely to be enhanced by schooling and valued in a wide variety of jobs in the labor market.[10] Graduates and GED recipients received average composite scores nine-tenths and seven-tenths of a standard deviation, respectively, above that of dropouts.

In the basic empirical model of the previous section, accumulated human capital was observed at the end of a woman's schooling. The ASVAB tests, however, were administered when many of the women in our subsample either had not yet completed their education or had completed their education years ago. This apparent shortcoming of the data actually offers a unique opportunity to learn more about how the process of accumulating human capital in school varies across individuals. A constant coefficient on schooling (β_2) was specified in the human capital equation of the previous section. This meant that the value added to cognitive achievement from a year of schooling was assumed to be constant across women. But this assumption is too restrictive, since the rate of acquisition of cognitive skills may vary across the average dropout, graduate, and GED recipient. Without some exogenous variation in schooling, it would be impossible to estimate the different average rates of human capital accumulation, since there would be no variation in the years of

schooling completed by graduates in 1985. The timing of the ASVAB tests was almost perfect for such a purpose. Only 31 percent of the women who eventually graduated from high school had not completed their schooling at the time of these tests. The same was true for 68.7 percent and 19.8 percent of the GED recipients and dropouts, respectively.

There is another advantage in using the ASVAB data. If we did observe the human capital of women at the end of their schooling, there would be such a high correlation between their years of schooling completed and age that it would be nearly impossible to separate the true return to schooling from the gain in cognitive achievement that might occur with age, regardless of educational attainment. Since, however, we observe the test results of people who have been out of school for a number of years, we can include an additional variable in the human capital equation for years elapsed since the termination of one's education. This should capture any gain in human capital with age independent of schooling, or any "depreciation" in these cognitive skills that might occur over time.

III. HUMAN CAPITAL ACCUMULATION

Using the NLSY data, we modify the original human capital equation in several ways.

$$(5)\quad H_{80} = \beta_1 Z + \beta_2 S_{80} + \beta_3 S_{80}{*}HS + \beta_4 S_{83}{*}GED + \beta_5 GED_{80} + \beta_6 Y_{80} + v$$

The dependent variable H_{80} is the composite ASVAB measure of cognitive achievement described in the previous section. The variable S_{80} is the highest grade completed by the individual at the time of the ASVAB tests. Separate rates of human capital accumulation during the formal schooling of dropouts (β_2), high school graduates ($\beta_2+\beta_3$), and CED recipients ($\beta_2+\beta_4$) will be estimated (the two

dummy variables HS and GED assume a value of one if the woman graduates from high school or receives her GED degree by the 1985 interview). The coefficient β_5 captures the incremental gain in human capital associated with the process of acquiring a GED degree by 1980. The coefficient β_6 estimates the rate of human capital accumulation (or depreciation) associated with any years that have elapsed since the completion of education by the time of the ASVAB tests (Y_{80}).

This revised human capital equation will be estimated separately from the other equations in the system. This assumption of recursivity is justified on the basis of the exogenous variation in educational attainment at the time of the ASVAB tests for a large portion of the women in our subsample and the separate rates of human capital accumulation that are allowed for these three educational groups. The alternative would be to estimate educational attainment and cognitive achievement in a simultaneous system. However, since the same vector of personal and family background characteristics would generally influence both outcomes directly, it would be difficult to find valid instrumental variables to identify differences in educational attainment across the women in our subsample.

Column 1 of Table 2 presents the results from the Ordinary Least-Squares (OLS) estimation of equation (5). Holding all else constant, black and Hispanic women score more than eight-tenths and two-tenths, respectively, of a standard deviation lower than women of other racial groups. Most of the family background characteristics have the expected signs and are significantly different from zero. For example, women born outside the South, those from households where reading material was available (i.e., newspapers and magazines or library cards), and those whose parents achieved higher levels of schooling have higher levels of cognitive achievement.

For the average dropout, each year of formal schooling adds one-tenth of a standard deviation to her cognitive achievement. The value added is nearly 50 percent higher for the average high school graduate (.147) and GED recipient (.145). All of these coefficients are highly significant. The lower

TABLE 2

Estimated Determinants of Human Capital Accumulation

	Without School Characteristics	With School Characteristics
Constant	-1.803** (.149)	-1.859** (.150)
Black	-.816** (.040)	-.675** (.053)
Hispanic	-.232** (.056)	-.092 (.071)
Born in South	-.135** (.034)	-.121** (.034)
Born in foreign country	-.278** (.074)	-.263** (.074)
Catholic	.016 (.040)	.019 (.040)
Lived in urban area at age 14	-.133** (.037)	-.113** (.037)
Lived in a household headed by a single female at age 14	-.046 (.037)	-.035 (.037)
Spoke foreign language other than Spanish at home at age 14	.237** (.074)	.238** (.073)
Newspapers or magazines in home at age 14	.175** (.038)	.169** (.037)
Library card in home at age 14	.136** (.033)	.142** (.033)
Number of older siblings	-.005 (.007)	-.006 (.007)
Number of younger siblings	-.024** (.008)	-.024** (.008)
Highest grade completed by father	.020** (.006)	.019** (.006)

(table continued)

TABLE 2, continued
Estimated Determinants of Human Capital Accumulation

Highest grade completed by mother	.043** (.007)	.043** (.007)
Health limitations	-.163** (.062)	-.170** (.062)
Highest grade completed (S_{80})	.100** (.014)	.101** (.014)
S_{80} * Eventual high school graduate	.047** (.004)	.045** (.004)
S_{80} * Eventual GED recipient	.045** (.007)	.044** (.007)
GED recipient (GED_{80})	.197* (.105)	.216* (.105)
Years since education completed (Y_{80})	-.000 (.008)	-.003 (.008)
S_{80} * % Black enrollment	------	-.023** (.009)
S_{80} * % Hispanic enrollment	------	-.030* (.012)
S_{80} * % Students disadvantaged	------	-.015* (.009)
S_{80} * % 10th graders who drop out	------	-.001 (.009)
S_{80} * Books per student in school library	------	.045* (.021)
S_{80} * Student-teacher ratio	------	-.033 (.033)
Adjusted R^2	.457	.462
Number of observations	---------- 2,601 ----------	

Notes: Standard errors in parentheses. Dependent variable is the composite ASVAB variable described in the text. School characteristics are described in the text and in footnote 11.

** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

rate of human capital accumulation among dropouts may be one reason why these women do not complete their secondary education. On the other hand, in terms of human capital accumulation during their formal schooling, GED recipients appear to be very similar to graduates.

There are three basic explanations for the different average rates of human capital accumulation between women who drop out and those who complete their secondary education: dropouts may have lower levels of innate reasoning ability; they may be raised in households that impede the learning process; or they may attend schools that have poor educational facilities. It is difficult to isolate this second factor from the others. Proxies already included in equation (5) capture the impact of family background on the level of cognitive achievement. The estimated rates of human capital accumulation in school already implicitly account for any average differences in both measured and unmeasured family backgrounds that affect the accumulation process.

With additional information available from the NLSY, however, it may be possible to isolate the impact of school quality on the accumulation of human capital. The human capital equation was reestimated with the addition of six proxies for school quality, interacted with the highest grade completed in 1980. These school characteristics were rescaled to have a zero mean for our subsample. In this way, the value added to cognitive achievement from a year of schooling is a function of the quality of the school attended, and β_2, β_3, and β_4 indicate the value added to human capital for women from schools with average characteristics.[11]

Column 2 of Table 2 presents the results from this enhanced human capital equation. All of the estimated coefficients on the variables that were interacted with school quality have the expected signs, and four of the six are significant. The rate of human capital accumulation is lower in schools with (1) higher black or Hispanic enrollments, (2) a larger proportion of disadvantaged students, and (3) fewer library books per student. The inclusion of these additional regressors accounts for some of the lower levels of human capital accumulation among both blacks and Hispanics. Yet, after

observed background characteristics and school quality are held constant, the average black woman scores nearly seven-tenths of a standard deviation lower on this measure of cognitive achievement.

Although school quality matters, it explains very little of the overall difference in the rates of human capital accumulation between dropouts and those who complete their secondary education. If the six proxies for school quality are all zero, then the individual comes from a school of average quality. From the reported coefficient estimates in Column 2 of Table 2, the value added from a year of schooling is .101 for dropouts and .146 for high school graduates. By differentiating this equation with respect to years of schooling, we can calculate the average value added from a year of schooling, given the characteristics of the schools actually attended by the women in our subsample. Since dropouts come from slightly worse schools, their mean value added falls to .099. Since graduates come from slightly better schools, their mean value added rises to .147. The average gain in human capital from a year of schooling for GED recipients is .145 in both cases. School quality does appear to influence the rate of human capital accumulation in school, but its overall impact is minimal.[12]

Holding all else constant, the estimated coefficient on GED_{80} in Column 2 of Table 2 indicates that the acquisition of a high school equivalency degree by the time of the ASVAB tests adds .216 of a standard deviation to cognitive achievement. This coefficient is significantly different from zero at a 10 percent level. These same GED recipients, however, would have acquired even more human capital by staying in school and completing their regular high school education. For the average GED recipient, the 1.78 years of schooling remaining for a high school diploma would have raised her human capital by .258 (1.78 * .145). Thus, in terms of cognitive achievement, the GED degree is not equivalent to a high school diploma.

The coefficients on Y_{80} are negative and statistically insignificant in both regressions. This supports the contention that the coefficients on educational attainment are picking up the increase in

human capital associated with schooling and not simply the aging process. There is no statistical evidence that this cognitive achievement depreciates with age.

The estimated coefficients from the second regression were used to update cognitive achievement for changes between 1980 and 1985 in educational attainment and years elapsed since the completion of this education. The partial derivative of this expression with respect to the highest grade completed was used to predict the value added to human capital from any additional formal schooling during this period. The same school quality is assumed to affect the accumulation of human capital in the years following 1980. As a result, the mean value of human capital rises from .267 to .371 for high school graduates, from .101 to .289 for GED recipients, and from -.641 to -.627 for dropouts. This "updated" ASVAB variable (H) will be used in all subsequent regression analyses.

A summary procedure is used to assess the relative contributions of the regressors and rates of human capital accumulation to the dispersion in measured cognitive achievement in 1985.[13] Let $E(H)=\Sigma_j b_j Z_j$, where the predicted value of human capital for each woman in our subsample is a linear function of the estimated coefficients from the second human capital equation multiplied by the independent variables for that individual. Certain groups of regressors are then set equal to their sample means, and predicted values of human capital are again produced. The variance of these predicted values are calculated, and the contribution of these regressors to the explained variance in human capital is estimated (e.g., $\mathrm{Var}(E(H))-\mathrm{Var}(E(H)|Z_j=\bar{Z})$). This restriction is then removed, another set of regressors is held constant, and the procedure is repeated. In addition, the rate of human capital accumulation is set at its mean value, and its contribution to the dispersion of human capital is also estimated (i.e., $\mathrm{Var}(E(H)-\mathrm{Var}(E(H|b_2=.133,b_3=0,b_4=0))$). The relative importance of each set of factors is then expressed as a percentage of the total of these contributions to the explained variance in cognitive achievement.

Table 3 reports the results from this procedure. If differences in personal and family background characteristics were eliminated (i.e. those explanatory variables listed in Table 2 from "Black" to "Health Limitations"), the measured dispersion in human capital would fall by 43.9 percent. Differences in the level of educational attainment account for 26.8 percent of this variation in cognitive achievement, while differences in the rate of human capital accumulation across these three educational groups account for 18.6 percent. The remaining 10.7 percent of this dispersion comes from differences in the observed quality of the schools attended by these women.

IV. RATES OF RETURN IN THE LABOR MARKET: CONTROLLING FOR SAMPLE SELECTION BIAS FROM EMPLOYMENT

We now estimate the rates of return to a secondary education in the labor market. We continue to assume that educational outcomes are exogenously determined, but allow for the possible sample selection bias associated with the fact that wage rates are only observed for employed women.

In developing the general employment and wage equations of Section I, it was assumed that the coefficients were constant across the three educational groups. A more general specification would interact all regressors in these two equations with eventual educational attainment. The returns to labor market experience, vocational training, human capital, and other factors may depend on the level of schooling completed. For example, cognitive skills may be relatively more important in determining wage rates in the jobs held by high school graduates. A secondary education may both add to one's stock of human capital and raise the value of human capital already attained. Sample selection bias from employment may also vary by educational attainment. Unobserved determinants of the market wage may have a relatively larger impact on the employment outcomes of poorly educated women. With their lower average earnings capacity, dropouts may be more likely to face

TABLE 3

Relative Contributions to Dispersion in Measured Human Capital

	Absolute Differences	Percentage of Total
Personal and family background characteristics	.313	43.9
Educational attainment	.192	26.8
Value added from formal schooling	.133	18.6
School quality	.076	10.7
Total	.714	100.0

constraints on their labor supply behavior (e.g. the minimum wage). To test this hypothesis, separate rates of sample selection bias must be estimated.

The new employment and wage equations can be written:

$$(6) \qquad E^*_j = \tau_{1j}X + \tau_{2j}H + \tau_{5j}Q + \psi_j \qquad j = DRP,GED,HS$$

$$(7) \qquad \ln W_j = \gamma_{1j}X + \gamma_{2j}H + \epsilon_j$$

where the human capital variable (H) is the updated measure of cognitive achievement constructed in the previous section. The overall subsample is divided into three groups by eventual educational attainment: dropouts (DRP), GED recipients (GED), and high school graduates (HS). We observe the employment status and wage rates for working women in a single schooling state. These dependent variables, coefficients, and error terms are subscripted by educational attainment.

The expectation of the log wage for working women can be written:

$$(8) \qquad E(\ln W_j | E^*_j > 0) = \gamma_{1j}X + \gamma_{2j}H + \eta_j\lambda_j \qquad j = DRP,GED,HS$$

where the additional constructed regressor λ_j is the mean of a truncated normal distribution or inverse Mill's ratio (Heckman, 1980). Each equation will yield unbiased estimates of the determinants of the earnings capacities for all women within that schooling state, regardless of their current employment status. A positive sign on η_j indicates that an employed woman faces a higher market wage than a woman with similar observed characteristics who is not employed.

Table 4 presents the results from the maximum likelihood probit estimation of the three employment equations. The dependent variable assumes a value of one if the woman was employed at the time of the 1985 interview and zero otherwise. Human capital has a positive and significant

TABLE 4

Estimated Determinants of Employment Propensities

	High School Graduates	GED Recipients	Dropouts
Constant	-2.051 (5.214)	-12.626 (12.748)	-8.151 (6.716)
Black	.088 (.104)	-.005 (.327)	-.418* (.206)
Hispanic	.090 (.113)	.011 (.315)	.276* (.141)
Health limitations	-.409* (.163)	.447 (.530)	-.247 (.227)
Number of children in household	-.204* (.104)	.329 (.214)	.196** (.109)
Presence of preschool child	-.023 (.110)	-.390 (.286)	-.330* (.133)
Presence of infant	-.593** (.111)	-1.354** (.296)	-.334* (.138)
Pregnant	-.353** (.137)	-.653 (.479)	-.233 (.238)
Married	.262* (.111)	.300 (.313)	-.053 (.150)
Earnings of spouse	-.014** (.005)	-.018 (.013)	-.005 (.007)
Nonlabor household income	-.129 (.142)	-.502 (1.216)	-.132 (.570)
Family-specific AFDC guarantee	-.647* (.270)	-.374 (.634)	-1.247** (.341)
Age	.245 (.438)	1.206 (1.094)	.756 (.573)

(table continued)

TABLE 4, continued

Estimated Determinants of Employment Propensities

Age squared	-.005 (.009)	-.031 (.023)	-.014 (.012)
Area unemployment rate	-.037** (.014)	-.001 (.041)	-.098** (.021)
Predicted labor market experience	.061 (.085)	.696** (.224)	-.333* (.158)
Vocational training	.140* (.072)	.633** (.207)	-.006 (.124)
Human capital (H)	.293** (.045)	.392** (.153)	.318** (.068)
Log-likelihood	-883.3	-114.0	-408.5
Pseudo R^2	.159	.272	.133
Number of observations	1,650	227	724

Notes: Standard errors in parentheses. Dependent variable assumes a value of one if the woman was employed at the time of the 1985 interview and zero otherwise. Variables "Earnings of spouse," "Nonlabor household income," and "Family-specific AFDC guarantee" are measured in thousands of 1985 dollars. "Pseudo R^2" is calculated as 1-L(K)/L(0), where L(K) is the log-likelihood with K nonconstant regressors.

** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

impact on these employment propensities. Holding all else constant, a one-standard deviation increase in this variable raises the employment probability by 10.4 percentage points for the average graduate, 15.8 percentage points for the typical GED recipient, and 11.7 percentage points for the average dropout.

Another variable of interest in these regressions is the "Family-Specific AFDC Guarantee". Intended to capture the inherent work disincentives under AFDC, this variable represents the estimated maximum monthly AFDC benefit available to women at the time of the 1985 interview. For this variable to be positive, a woman must be categorically eligible for AFDC. Eligibility depends on her own family circumstances (e.g., her marital status, the presence of children in the household, and the availability of other nonlabor income) and the characteristics of the AFDC program in her state of residence (e.g., the maximum benefit or guarantee for the size of her family and the availability of benefits to pregnant women or those with unemployed spouses). For those categorically eligible, the Family-Specific AFDC Guarantee is simply the maximum benefit a woman could receive, given the size of her family and other income, if she did not work in the labor market.

The coefficients on this variable are negative, as hypothesized, and significantly different from zero among both graduates and dropouts. This is true even after household structure and nonlabor income are held constant. Taking the partial derivatives of this employment equation for the average categorically eligible woman, we find that a 10 percent rise in this effective guarantee would lower the probability of employment by .7 percentage points among graduates and 1.1 percentage points among dropouts.

Predicted values rather than actual years of labor market experience are included in both the employment and log wage equations. Experience is included in both equations to capture incremental gains in earnings capacities associated with the accumulation of on-the-job productivity. If we include actual experience in these regressions, however, we might overstate these rates of return. The reason

is that experience is an endogenous variable, and higher levels of unobserved productivity may lead to the acquisition of more work experience and higher wages. The error terms in these equations would be positively correlated with actual experience, and the coefficients on this regressor would be biased upward. To eliminate this potential bias, we substitute predicted values for actual experience. The key instrumental variable in these experience regressions is the number of months elapsed since the completion of a woman's formal schooling. This variable is interacted with race, health status, marriage and birth histories, and the average local unemployment rate over the observed period since the completion of schooling. These experience regressions are estimated separately for the three educational groups.[14]

Table 5 lists the results from the OLS estimation of the three log wage equations. Constructed hourly earnings come from the main job held by employed women at the time of the 1985 interview. Consider first the estimated coefficients on race in these equations. Among graduates, black women face 7.3 percent higher market wages than whites and other non-Hispanics, holding all else constant. This coefficient is statistically significant. This finding can be explained by the inclusion of the human capital variable in this regression. When this variable is removed, it is estimated that black graduates would face 6.7 percent lower wage rates. This coefficient is also statistically significant. Recall that blacks, on average, scored substantially lower on the ASVAB tests. Two extreme interpretations can be given to this finding: either these tests accurately represent the cognitive achievement of all racial groups, but employers are prevented by law from compensating these women accordingly; or they are racially biased indicators of true cognitive achievement, and equally productive black graduates face lower wages in the labor market.

Labor market experience has a positive and significant impact on earnings capacities across all three educational groups. Using predicted values, the rates of return to a year of experience are 5.8 percent for both graduates and dropouts. Using actual experience, the estimated rates of return were

TABLE 5

Estimated Determinants of Market Wage Rates
(Single Selection Model)

	High School Graduates	GED Recipients	Dropouts
Constant	1.378**	1.093**	1.312**
	(.061)	(.177)	(.120)
Black	.073*	.083	-.012
	(.030)	(.098)	(.066)
Hispanic	.078*	.090	.087
	(.035)	(.095)	(.054)
Health limitations	-.005	.071	.007
	(.059)	(.138)	(.082)
Area unemployment rate	-.014**	.007	-.012
	(.004)	(.011)	(.008)
Area population in millions	.044**	.064*	.021
	(.008)	(.031)	(.013)
Predicted labor market experience	.058**	.094**	.058*
	(.009)	(.033)	(.030)
Vocational training	.071**	.048	-.004
	(.021)	(.062)	(.046)
Human capital (H)	.126**	.128**	.077**
	(.015)	(.045)	(.030)
Sample selection term for employment (λ)	.041	-.040	.135
	(.047)	(.104)	(.085)
Adjusted R^2	.166	.107	.047
Number of observations	1,100	123	257

Notes: Standard errors in parentheses. Dependent variable is the natural log of hourly earnings in the main job held at the time of the 1985 interview.

** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

6.2 percent for graduates and 9.1 percent for dropouts. Thus, predicted values appear to reduce the upward bias on these estimated coefficients. Only among GED recipients does the predicted value for experience yield a higher rate of return (9.4 percent) than that associated with the actual values of this variable (8.4 percent). This result is attributed to the small number of GED recipients in our subsample.

In Table 5, the coefficients on human capital are positive and significant in all three wage equations yet substantially lower for dropouts (7.7 percent) than for either graduates (12.6 percent) or GED recipients (12.8 percent). The coefficients on the sample selection terms are all insignificant; however, there is some evidence of "positive" sample selection bias associated with the employment status among dropouts. This coefficient is significant at a 11.4 percent level, using a two-tailed test. This means that working female dropouts face higher wages than nonworking female dropouts with the same observed characteristics. Again, this may be the result of their lower average earnings capacity, combined with rigidities in the labor market. Dropouts who face unusually low market wages may find it difficult to locate employment. Evidence supporting this conjecture can found in Table 1. Relative to those employed, unemployment or discouragement is much more prevalent among dropouts (53.0 percent) than either GED recipients (28.4 percent) or high school graduates (17.4 percent).

The importance of these estimated differences in sample selection bias across the three educational groups can be seen when we calculate the gaps in earnings capacities between women who drop out and those who complete their secondary education. The average wage rate is $5.44 for employed graduates and GED recipients and $4.50 for employed dropouts. Using the above wage equations, we can estimate the earnings capacities of all women in these schooling categories, regardless of their current employment status.[15] The average "potential" market wage rate is $5.20 for secondary school completers and $3.85 for dropouts. Part of the reason for these lower overall earnings

capacities is that women who are not employed have lower levels of observed productivity characteristics than those who are employed (i.e. less labor market experience, vocational training, and human capital). However, the earnings capacities of dropouts who are not working are also affected by the positive sample selection bias noted above. In other words, since these nonworking dropouts also have relatively lower levels of "unobserved" productivity, they substantially lower the average earnings capacity among all dropouts. Thus, the observed gap in wage rates between working secondary school completers and dropouts ($.94) underestimates the gap in earnings capacities between all women in these two educational groups ($1.35).

These wage regressions can be used to estimate the expected gains in earnings capacities for dropouts if they were to complete their secondary education. These expressions can be written:

$$(9) \qquad \Delta \ln W_{HS} = [\gamma_{1HS} X + \gamma_{2HS}(H + \Delta H_{HS})] - [\gamma_{1DRP} X + \gamma_{2DRP} H + \eta_{DRP} \lambda_{DRP}]$$

$$(10) \qquad \Delta \ln W_{GED} = [\gamma_{1GED} X + \gamma_{2GED}(H + \Delta H_{GED})] - [\gamma_{1DRP} X + \gamma_{2DRP} H + \eta_{DRP} \lambda_{DRP}]$$

where $\Delta \ln W_{HS}$ and $\Delta \ln W_{GED}$ are the expected increases in log wages for a dropout who acquires either a high school diploma or a GED degree, respectively. The variables ΔH_{HS} and ΔH_{GED} are the estimated gains in human capital for dropouts associated with the attainment of these degrees. As shown in Table 1, the average dropout would have to complete 2.47 years of schooling to finish her high school education. It is assumed that each year of this schooling would add one-tenth of a standard deviation to her cognitive achievement. Thus, ΔH_{HS} is equal to .247 for the average dropout. Unfortunately, we have no experimental data to estimate how the process of accumulating

human capital in acquiring a GED degree might vary between those who do and do not become actual recipients. Since we do know, however, that the average dropout gains less human capital from regular schooling compared with the average GED recipient, we assume that the same would hold for the process leading to the GED degree. Thus, ΔH_{GED} is equal to .149 for the average dropout (the estimated gain in cognitive achievement of GED recipients in the second human capital equation (.216) deflated by the ratio (.100/.145)).

The estimated coefficients in expressions (9) and (10) come from the three log wage equations and are marked accordingly. Note that the correction term for sample selection bias is included in the estimated earnings capacities for dropouts in their present educational state, but not in the estimates of their earnings capacities in the alternative educational states. This is because we only observe the work outcomes of these women in their chosen schooling state.

The percentage change in the geometric mean wages can now be calculated for the average dropout.[16] The estimated rate of return to a regular high school education is 10.2 percent, while the rate of return to a GED degree is 6.2 percent. Thus, the current mean earnings capacity of dropouts would increase from \$3.85 to \$4.24 with a high school diploma and to \$4.09 with a GED degree. Even with this additional education, a substantial portion of the overall gap in earnings capacities between those with and without a secondary education would remain. A high school diploma would eliminate 28.9 percent of the difference in potential market wage rates between the average secondary school completer and dropout; a GED degree would close 17.8 percent of this gap. The remaining differences would persist because of the lower levels of cognitive achievement among dropouts, their lower rates of human capital accumulation from this education, and differences in other productivity characteristics such as labor market experience and vocational training.

We can compare these estimated rates of return with those facing secondary school completers. The productivity characteristics of the average high school graduate and GED recipient are now

substituted into expressions (9) and (10), respectively. The gains in human capital to these individuals will reflect their higher rates of accumulation from this education. The rate of return for the last 2.47 years of formal schooling (i.e. the point where the average dropout terminated her schooling) is estimated to be 17.7 percent for the average graduate. The rate of return from a GED degree is estimated to be 16.0 percent for the average GED recipient. Thus, we see some evidence of the sorting process that separates secondary school completers and dropouts. Those women who complete their secondary education do so because, on average, they face relatively higher rates of return to this education.

V. RATES OF RETURN IN THE LABOR MARKET: CONTROLLING FOR SELF-SELECTION IN SCHOOLING

We have found that the earnings capacities of dropouts would increase from the acquisition of either a regular high school diploma or a GED degree, after considering the lower levels of innate ability and lower rates of human capital accumulation among these women. In this section, we ask whether or not these estimated rates of return might still be overstated because of sample selection bias associated with these schooling outcomes. Individuals who choose to complete their secondary education may have unobserved personal characteristics like perseverance, motivation, or self-discipline that would raise their earnings capacities, independent of their educational attainment. Our measure of cognitive achievement may not capture such personality traits. By not controlling for the endogeneity of schooling, too much of the higher earnings capacities of secondary school completers may be attributed to their educational attainment.

We begin by recognizing the possible self-selection inherent in the decision of whether or not to complete a secondary education.[17] The results from the previous section indicate that high school

graduates and GED recipients are very similar in terms of their accumulation of cognitive achievement from regular schooling, returns to this human capital in the labor market, sample selection bias from employment, and overall earnings capacities. For this reason, we collapse high school graduates and GED recipients into the same schooling outcome, and express educational attainment as a dichotomous variable.

$$(11) \qquad S^* = \alpha Z + u$$

The woman either completes her secondary education ($S^* > 0$) or she does not ($S^* \leq 0$). This endogenous "switching equation" sorts women into the two schooling states.[18]

The determinants of both the employment state and the market wage rate are allowed to fully interact with these alternative schooling outcomes.

$$(12) \qquad E^*_{DRP} = \tau_{1DRP}X + \tau_{2DRP}H + \tau_{3DRP}Q + \psi_{DRP}$$

$$(13) \qquad \ln W_{DRP} = \gamma_{1DRP}X + \gamma_{2DRP}H + \epsilon_{DRP}$$

$$(14) \qquad E^*_{SEC} = \tau_{1SEC}X + \tau_{2SEC}H + \tau_{3SEC}GED + \tau_{4SEC}Q + \psi_{SEC}$$

$$(15) \qquad \ln W_{SEC} = \gamma_{1SEC}X + \gamma_{2SEC}H + \gamma_{3SEC}GED + \epsilon_{SEC}$$

A dummy variable for GED recipiency is included in equations (14) and (15) to capture any systematic differences in these alternative secondary school degrees.

Since the same unobserved factors may affect both the schooling and employment outcomes (i.e., u may be correlated with ψ_{DRP} and ψ_{SEC}), these equations will be estimated in a bivariate probit

system. For example, women who expect to spend a larger portion of their adult lives in the labor market may be more likely to complete their secondary education.

Once we have estimated the coefficients in the schooling and conditional employment equations, we can estimate the determinants of the two market wage equations.

$$(16)\quad E(\ln W_{DRP} \mid S^* \le 0, E^*_{DRP} > 0) = \gamma_{1DRP}X + \gamma_{2DRP}H + \eta_{aDRP}\lambda_a + \eta_{bDRP}\lambda_b$$

$$(17)\quad E(\ln W_{SEC} \mid S^* > 0, E^*_{SEC} > 0) = \gamma_{1SEC}X + \gamma_{2SEC}H + \gamma_{3SEC}GED + \eta_{aSEC}\lambda_a + \eta_{bSEC}\lambda_b$$

Two constructed variables are included in each wage equation to correct for possible sample selection bias associated with both the schooling and employment outcomes.[19] We only observe the wage rates of employed women in their chosen schooling states. Again, a positive sign on η_{bDRP} or η_{bSEC} indicates that employed women face higher market wages than women with similar observed characteristics who are not employed. Since λ_a will be negative for women who drop out and positive for those who complete their secondary education, the signs on the estimated coefficients η_{aDRP} and η_{aSEC} will indicate the direction of any sample selection bias associated with the decision whether to complete a secondary education. If $\eta_{aDRP} < 0$ and $\eta_{aSEC} > 0$, then self-selection is based on "comparative advantage" and women who complete their secondary education (drop out) face relatively higher wage rates in their chosen schooling state. If $\eta_{aDRP} > 0$ and $\eta_{aSEC} > 0$, then "positive" self-selection exists, and women who complete their secondary education face higher wage rates in either schooling state.

Table 6 presents the results from the bivariate probit estimation of the schooling and conditional employment equations. All else held constant, black and Hispanic women in our subsample were more likely to graduate from high school or receive their GED degree. Women at age 14, however, who lived either in urban areas or female-headed households or had poorly educated parents were less

TABLE 6

Estimated Determinants of Secondary School Completion and Employment Propensities

	Secondary School Completed	Employment Conditional on Secondary School Completion	Employment Conditional on Dropping Out
Constant	-1.449 (1.007)	-.400 (4.520)	-7.564 (7.038)
Black	.640** (.104)	.012 (.096)	-.440* (.225)
Hispanic	.417** (.128)	.112 (.100)	.284* (.140)
Health limitations	-.212* (.120)	-.287* (.145)	-.220 (.250)
Born in South	-.067 (.078)	------	------
Born in foreign country	.084 (.137)	------	------
Catholic	.207** (.078)	------	------
Lived in urban area at age 14	-.294** (.072)	------	------
Lived in a household headed by a single female at age 14	-.315** (.065)	------	------
Spoke foreign language other than Spanish at home at age 14	.165 (.135)	------	------
Newspapers or magazines in home at age 14	.199** (.066)	------	------
Library card in home at age 14	.296** (.061)	------	------

(table continued)

TABLE 6, continued

Estimated Determinants of Secondary School Completion and Employment Propensities

Number of older siblings	-.013 (.012)	------	------
Number of younger siblings	-.064** (.015)	------	------
Highest grade completed by father	.042** (.011)	-------	-------
Highest grade completed by mother	.058** (.012)	-------	-------
% 10th graders who drop out	-.340* (.163)	--- ---	-------
% Black enrollment	-.452* (.199)	-------	-------
% Hispanic enrollment	-.565* (.233)	-------	-------
% Students disadvantaged	-.247 (.183)	-------	-------
Student-teacher ratio	-.667 (.702)	-------	-------
Books per student in school library	1.033* (.457)	-------	-------
Area unemployment rate in 1985	-------	-.035** (.012)	-.096** (.021)
Number of children in household	------	-.137 (.090)	-.192 (.126)
Presence of preschool child	-------	-.041 (.092)	-.321* (.142)
Presence of infant	-------	-.603** (.096)	-.333* (.143)
Pregnant	-------	-.351** (.121)	-.226 (.254)
Married	-------	.269** (.099)	-.050 (.159)

(table continued)

TABLE 6, continued

Estimated Determinants of Secondary School Completion and Employment Propensities

Earnings of spouse	-------	-.014** (.004)	-.005 (.007)
Nonlabor household income	-------	-.140 (.144)	-.146 (.583)
Family-specific AFDC guarantee	-------	-.583* (.232)	-1.246** (.355)
Age	-------	.133 (.381)	.689 (.602)
Age squared	-------	-.003 (.008)	-.012 (.012)
Predicted labor market experience	-------	.085 (.078)	-.328* (.176)
Vocational training	-------	.168** (.063)	-.009 (.119)
Human capital (H)	-------	.240** (.044)	.293** (.077)
GED recipient	-------	-.219* (.101)	------
Correlation between error terms (ρ)	-------	-.576** (.144)	-.165 (.171)
Log-likelihood	-------	-2,386.4	-1,790.9
Number of observations	2,601	1,877	724

Notes: Standard errors in parentheses. Dependent variables assume values of one if the woman completed her secondary education and was employed at the time of the 1985 interview and zero otherwise.

** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

likely to complete their secondary education. The proxies for school quality have the expected signs on this schooling outcome. Most notably, women from schools with higher dropout rates among tenth graders were themselves more likely to drop out.

The estimated correlation between the error terms in the schooling and work equations are negative for both groups, but only significantly different from zero among women who complete their secondary education. This was a surprising result. It was expected that unobserved factors leading to the completion of a secondary education would be positively correlated with unobserved factors leading to subsequent employment. There are two explanations for why such was not the case: either women who unexpectedly completed their secondary education did not expect to work in the future (e.g., the "return" to this education may have occurred primarily through "better offers" in the marriage market); or they faced additional constraints on their labor supply.

Table 7 reports the results from the two wage equations. The estimated coefficients are similar to those reported in the previous section. The rate of return to human capital is substantially higher among women who complete their secondary education (12.5 percent), compared with those who drop out (8.0 percent). The negative coefficient on GED recipiency is insignificant. Thus, there is no statistical evidence that the particular type of secondary education is important in the labor market, once human capital and other factors have been held constant. The sample selection terms on employment are similar to those reported earlier. There is some evidence of positive sample selection bias among dropouts.

The most interesting coefficients in this estimation come from the sample selection terms that account for the decision of whether to complete a secondary education. Although both are insignificant, they suggest something about the type and magnitude of this self-selection bias. Since both η_{aSEC} and η_{aDRP} are estimated to be positive, positive self-selection is indicated. In other words,

TABLE 7

Estimated Determinants of Market Wage Rates
(Double Selection Model)

	Secondary School Completers	Dropouts
Constant	1.377**	1.334**
	(.059)	(.155)
Black	.063*	-.005
	(.030)	(.072)
Hispanic	.089**	.087
	(.034)	(.058)
Health limitations	.003	.004
	(.056)	(.087)
Area unemployment rate	-.012**	-.012
	(.004)	(.009)
Area population in millions	.045**	.022*
	(.008)	(.013)
Predicted labor market experience	.061**	.058*
	(.009)	(.031)
Vocational training	.069**	-.005
	(.020)	(.048)
Human capital (H)	.125**	.080**
	(.014)	(.031)
GED recipient	-.028	------
	(.034)	
Sample selection term for secondary school completion (λ_a)	.010	.021
	(.049)	(.073)
Sample selection term for employment (λ_b)	.029	.133
	(.047)	(.095)
Adjusted R^2	.169	.045
Number of observations	1,223	257

Notes: Standard errors in parentheses. The dependent variable is the natural log of hourly earnings in the main job held at the time of the 1985 interview.
** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

women who complete their secondary education face higher earnings capacities in either schooling state, even after human capital and other factors are held constant.

Using the technique developed by Oaxaca (1973), we can attribute differences in overall earnings capacities between secondary school completers and dropouts to differences in their productivity characteristics and the returns to these factors. The gap between the geometric mean wages of the average secondary school completer and dropout can be written:

$$(18) \quad \ln\bar{W}_{SEC} - \ln\bar{W}_{DRP} = \gamma_{SEC}\bar{X}_{SEC} - \gamma_{DRP}\bar{X}_{DRP}$$
$$= \gamma_{SEC}(\bar{X}_{SEC} - \bar{X}_{DRP}) + \bar{X}_{DRP}(\gamma_{SEC} - \gamma_{DRP})$$

where γ_{SEC}, $\bar{X}_{SEC}$, γ_{DRP}, and $\bar{X}_{DRP}$ represent the vectors of all estimated coefficients and mean independent variables from the two regressions, respectively. After some algebraic manipulation, we can write this difference in potential market wage rates as the sum of two components. The first term is the proportion of the gap "explained" by differences in the mean characteristics between the two groups, while the second term is the "unexplained" component. The latter term is the residual effect of a secondary education. It captures differences in all coefficients, the constant terms, and the GED dummy variable on these log wages.

Table 8 presents these results. Since the component explained by differences in mean characteristics could, alternatively, be measured with the estimated coefficients from either equation, we report both calculations. If we gave the average dropout the same mean personal characteristics (i.e., race, health limitations) and local labor market conditions (i.e., population size and unemployment rate of the local metropolitan area or county) of the average secondary school completer, her earnings capacity would decrease by .8 to 1.1 percent. In other words, the relatively higher wage rates faced by secondary school completers are not due to these personal characteristics

TABLE 8

Relative Contributions to the Gap in Earnings Capacities Between the Average Secondary School Completer and Dropout

	Percentage Change in the Predicted Market Wage Using:	
	Coefficients from the Secondary School Wage Equation	Coefficients from the Dropout Wage Equation
Personal characteristics and local labor market conditions	-1.1	-.8
Labor market experience	9.7	9.2
Vocational training	1.7	-.1
Human capital (H)	13.1	8.2
Self-selection in completion of secondary education	1.5	3.3
Residual effect of a secondary education	5.5	10.4

Notes: The percentage change in the market wage is calculated as $100(e^{\Delta \ln W}-1)$. See footnote 16.

or local labor market conditions. However, if we gave this same dropout the average labor market experience of the secondary school completer, her earnings capacity would increase by 9.2 to 9.7 percent. Potentially even more important is the difference in measured cognitive achievement between these groups. The average human capital of secondary school completers would raise the earnings capacity of the dropout by 8.2 to 13.1 percent. On the other hand, the factors that lead to self-selection from this schooling decision prove to be relatively unimportant. If these average unmeasured productivity characteristics were given to the typical dropout, her potential market wage would rise by 1.5 to 3.3 percent. Finally, if dropouts were given the average educational level of these secondary school completers, all else constant, the earnings capacity of the average dropout would increase by 5.5 to 10.4 percent. This result could be interpreted either as the signaling value of this education or the human capital attained during this schooling not captured by our measure of cognitive achievement.

We can now estimate the incremental gain in the earnings capacity for the average dropout if she received either her high school diploma or GED degree.

$$(19)\quad \Delta \ln W_{HS} = [\gamma_{1SEC}X + \gamma_{2SEC}(H + \Delta H_{HS})] - [\gamma_{1DRP}X + \gamma_{2DRP}H + \eta_{bDRP}\lambda_b] + (\eta_{aSEC}-\eta_{aDRP})\lambda_a$$

$$(20)\quad \Delta \ln W_{GED} = [\gamma_{1SEC}X + \gamma_{2SEC}(H + \Delta H_{GED}) + \gamma_{3SEC}GED] - [\gamma_{1DRP}X + \gamma_{2DRP}H + \eta_{bDRP}\lambda_b] + (\eta_{aSEC}-\eta_{aDRP})\lambda_a$$

These expected returns to this education are based on the current productivity characteristics of dropouts, the additional human capital associated with these degrees estimated in the previous section, the estimated coefficients from these two wage equations, and the appropriate sample selection terms.

Again, only the sample selection term for the employment outcome in the chosen schooling state can be included in these calculations. For ease of interpretation, we isolate the impact of the sample selection term for secondary school completion λ_s. Since this variable is negative for dropouts and η_{sSEC} and η_{sDRP} are both positive, the sign of this third term depends on the relative magnitude of these estimated coefficients. Since $\eta_{sSEC} < \eta_{sDRP}$, the inherent self-selection in completing this secondary education actually increases the estimated rates of return to dropouts. However, this effect is relatively small. It is estimated that the completion of a regular high school education would raise the earnings capacity of the average dropout by 10.9 percent. A GED degree, on the other hand, would increase her earnings capacity by 6.5 percent. These rates of return are only slightly higher than those estimated in the previous section (10.2 percent and 6.2 percent), where no consideration was given to the possible self-selection in the schooling decision.

As in the previous section, we can show that a substantial portion of the overall gap in earnings capacities between those with and without a secondary education would remain, even if dropouts were to attain this additional education. Given the rates of return estimated above, a high school diploma would eliminate 31.3 percent of the difference in potential market wage rates between the average secondary school completer and dropout; a GED degree would close 18.7 percent of this gap.

We can compare these estimated rates of return with those facing secondary school completers. The rate of return for the last 2.47 years of formal schooling is now estimated to be 15.9 percent for the average graduate. The rate of return from a GED degree is estimated to be 12.9 percent for the average GED recipient. We again see that women who complete their secondary education do so because, on average, they face relatively higher rates of return to this education. Most of this self-selection, however, was already captured by the simpler model discussed in the previous section.

VI. CONCLUSION

Our study suggests that female high school dropouts, on average, could increase their potential market wage by 10.2 to 10.9 percent if they completed their regular high school education, or by 6.2 to 6.5 percent if they received their GED degrees. This is true even after an allowance is made for the lower levels of innate ability among dropouts, their lower rates of human capital accumulation in school, and the possibility that they have poor unobserved productivity characteristics that would lower their earnings capacities regardless of educational attainment.

Recent welfare reform suggests that general educational attainment might be used to raise the economic self-sufficiency of those most likely to be at risk of welfare recipiency--high school dropouts. The results from our study provide both good and bad news to policymakers. The good news is that completing either a high school diploma or a GED degree could raise the earnings capacities of the dropouts in our subsample, even though the subsequent rates of return will be somewhat lower for them than for those women who have already completed their secondary education. The bad news is that the potential market wages already facing female dropouts are substantially lower than those facing high school graduates and GED recipients. This additional educational attainment would only eliminate up to one-third of the current gap in earnings capacities between these groups.

The results from this study have been generated without the use of experimental data that would track those dropouts who actually return to complete their secondary education. Instead, data on the actual educational outcomes of a cross-section of women have been used to model the process that leads to differences in potential market wage rates and to simulate the possible returns to a secondary education. Much more could potentially be learned by taking the former approach. Also, there is no attempt to assess the potential impact of this increased earnings capacity on the future welfare

recipiency among dropouts. Policymakers need to know both the return to this education in the labor market and the return to this education in terms of subsequent welfare recipiency. Future studies should carry these results to this next level of analysis.

Notes

1. Following the initial optimism over the role of subsidized education and training at the outset of the War on Poverty, there developed a general consensus among researchers that, except for a few specific programs and populations, these policies were largely ineffective at raising participants' earnings, reducing poverty rates, etc. (e.g., see Burtless, 1986 and Glazer, 1986). Many of these studies, however, focused on specific educational programs that targeted preschool and primary school children. This study examines the attainment of a secondary education for the average female dropout in her late teens and twenties.

2. One experiment entitled Project Redirection encouraged AFDC recipients who had dropped out of school to obtain their GED degrees. Its goal was to increase the economic self-sufficiency of and to discourage pregnancies among these recipients. The results of the program have been mixed (Polit, Quint, and Riccio, 1988). By the five-year follow-up, Project Redirection participants were more likely to be employed and were receiving higher weekly earnings than the comparison group. Since the same proportion of women in both groups had completed their secondary education, however, it would be difficult to attribute these labor market differences to educational attainment.

3. See Boissiere et al. (1985) for a similar model used to estimate the returns to a secondary education for workers in Kenya and Tanzania.

4. Person subscripts are suppressed throughout this paper for notational simplicity.

5. See Griliches (1977) for an excellent discussion of this issue.

6. Since any proxy will measure human capital with some error, this "signal" may capture some of the human capital acquired in school. It therefore represents an upper bound on the signaling value of educational attainment.

7. Exclusions were also made for women who were self-employed, working without pay, farmers, in the military, unable to work because of health limitations, or enrolled in government training programs. Observations were dropped because of missing information on key variables (e.g., state of residence and hourly earnings for those employed).

8. A GED degree can be earned by successfully completing tests on mathematics, social studies, science, reading skills, and writing skills. All states grant this high school equivalency status, but the criteria for awarding this degree vary by state. Many individuals enroll in "GED preparatory classes" before taking the exams.

9. Discouraged workers are individuals who are not working and not actively seeking employment, but would work if jobs were available. They report that they have discontinued their job search because either no work was available, they couldn't find employment, or they lacked the necessary schooling. The rate of discouragement for dropouts (3.5 percent) is more than twice the rate for GED recipients (1.3 percent) and high school graduates (1.6 percent).

10. The average of the scale scores on these seven tests (general science, arithmetic reasoning, word knowledge, paragraph comprehension, numerical operations, coding speed, and mathematics knowledge) was rescaled to have a zero mean and unit variance for this sample. The three excluded tests are auto and shop information, mechanical comprehension, and electronics information.

11. The NLSY conducted a "school survey" in 1979, where representatives from the school last attended by the youth provided information about that school. These data are available for over two-thirds of the women in the current sample. Instead of excluding the remaining one-third of the sample, these women were treated as if they had attended a school with the mean characteristics of those of their race (black, Hispanic, white, and others) where this information was reported. For example, unless other information is available, a black woman is assumed to come from a school where 39.8 percent of the students are disadvantaged; a white woman is assumed to come from a school where only 19.7 percent are disadvantaged. This decision is justified on the basis of the continuing racial segregation of secondary schools in the United States.

12. See Summers and Wolfe (1977) for a study that finds somewhat larger impacts of school quality on cognitive achievement. The magnitude of the effects in this study might be attributed to the absence of school information for nearly one-third of the sample (see the previous footnote), or the limited number of school characteristics included in this regression.

13. See Boissiere et al. (1985) for an application of this technique and Behrman, Knight, and Sabot (1983) for a comparison of this and other methods for decomposing sources of inequality.

14. These regression results are not reported, but are available from the author upon request.

15. One-half of the estimated variance from these wage equations must be added to these predicted log wages before the antilogs can be computed and the means taken. This corrects for the inherent bias in estimating the expected wage rate from a log wage equation (Dadkhah, 1984).

16. The percentage change in the market wage is calculated as $100(e^{\Delta \ln W_j}-1)$, where j=HS,GED. See Halvorsen and Palmquist (1980).

17. See Willis and Rosen (1979) for a study that empirically estimates the existence of self-selection bias in the decision of whether or not to attend college.

18. Alternatively, we could recognize the three educational outcomes. However, a computationally burdensome trivariate probit model would be necessary to estimate the sequential educational decisions (i.e., whether or not to complete high school and whether or not to complete a GED degree for those who do not complete high school), along with the employment outcomes, conditional on these three educational states.

19. For example, the lambda terms for women who complete their secondary education and who are employed can be written:

$$\lambda_a = \phi(C_1)\Phi(C_2^*)/P \qquad \lambda_b = \phi(C_2)\Phi(C_1^*)/P$$

$$C_1 = \alpha Z \qquad C_2 = \tau_{1SEC}X + \tau_{2SEC}H + \tau_{3SEC}GED + \tau_{4SEC}Q$$

$$C_1^* = (C_1-\rho C_2)/(1-\rho)^2 \qquad C_2^* = (C_2-\rho C_1)/(1-\rho)^2$$

where the coefficients and the correlation between the error terms (ρ) come from the bivariate probit estimation, $\phi(.)$ is the density, $\Phi(.)$ is the cumulative distribution function of the standard normal, and P is the probability of observing an employed high school graduate or GED recipient. See Tunali (1982) or Maddala (1983, pp. 278-283) for additional details on this double selection procedure.

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